

OARIUS GRISESCENS (COLEOPTERA: CURCULIONIDAE, ENTIMINAE), A NEW PEST OF PRUNUS ARMENIACA IN TURKEY

Burcu İnal* and Ayşe Özdem

Directorate of Plant Protection Central Research Institute, Ankara, Turkey

*Corresponding author's e-mail: burcuinal7@gmail.com

In this research, *Oarius griseus* Desbrochers des Loges has been identified for the first time in apricot orchards in the world and the Yalvaç district of Isparta province in Turkey. Field studies were carried out to monitor the presence of adults of *Oarius griseus* in apricot orchards, and the type of damage caused and control. As a result of the surveys, *O. griseus* adults were found in the root area of apricot trees during the day and became active during the night and fed on the newly emerging shoots. *O. griseus* adults started to emerge from the second week of September, that they were present in the nature for approximately 6-7 weeks during September-November, and that they were active on trunks until December when the temperature was appropriate. It was requisite to monitor the pest in apricot orchards by using siliconized fiber traps starting from September and controlling adults before damaging the fruits and buds. *O. griseus* can be controlled by mass trapping when the pest density is low. However, since the density of the pest was very high in the years of study, the traps solely could not be sufficient. Therefore, besides siliconized fibers, the pest should be controlled after harvest with an appropriate insecticide in the second week of September when the adults start to emerge.

Keywords: *Oarius griseus*, apricot, injury, mass trapping, control.

INTRODUCTION

Apricot (*Prunus armeniaca*) is a fruit that can be consumed throughout the year as fresh, dried and canned, and it has an important place in human nutrition. The homeland of apricot is a vast region stretching from Turkistan to Western China (Bailey and Hough, 1975). Our country, the gene center of many fruit species, is one of the first places where apricot is grown (Sykes, 1972). According to 2019 data, apricot production in our country is 846.606 tons (Anonymous, 2019). Turkey produces 63% of the dried apricot globally and is the leader in dried apricot production and exports. Our total export of dried apricots was 96 400 tons in 2020, which provided a foreign currency inflow of approximately 252 661 dollars to our country (Anonymous, 2020).

Many detrimental organisms cause injury to apricots, and some of the important pest species are European common cicada (*Lyristes plebejus* (Scopoli) (Hemiptera: Cicadidae), European leaf roller (*Archips rosanus* L.) (Lepidoptera: Tortricidae), Weevils (*Rhynchites* spp. (Coleoptera: Curculionidae)), plum scale (*Sphaerolecanium prunastri*) (Hemiptera: Coccidae)), Mealy plum aphid (*Hyalopterus pruni* (G.) (Hemiptera: Aphididae)), Flatheaded woodborers

(*Capnodis tenebrionis* L., *C. carbonaria* Klug.) (Coleoptera: Buprestidae), Peach twig borer, *Anarsia lineatella* Zell. (Lepidoptera: Gelechiidae) (Anonymous, 2017).

In the province of Isparta, apricot cultivation has been economically carried out, and in the last two years, complaints have increased by apricot producers that a pest species harms apricots. As a result of sampling in apricot orchards, *Oarius griseus* Desbrochers des Loges, 1905 (Coleoptera: Curculionidae, Entiminae) was found in apricot fields in Isparta. The pest is found mainly in Roxana, Alyanak, Aplikoç, Şekerpere and Iğdır apricot varieties that are widely grown in the region and exported. The pest has been identified for the first time in apricot orchards worldwide and our country. The damage pattern of the adult and larvae of the genus *Otorhynchus* from the same family is very similar to the damage pattern of the *O. griseus* species we detected in apricot. Many species belonging to this family were identified in the world, among which *Otorhynchus clavipes* Bondroff has been reported to be a pest in raspberry, plum, apricot, peach, nectarine, gooseberry, and *O. singularis* (L.) to be a pest in apple. Adults of these species damage the buds, bud eyes, young shoots and leaves, and the larvae damage the roots (Hill, 1987). The genus *Otorhynchus* (Coleoptera:



Curculionidae) is injurious to many horticultural plants worldwide, causing economic damage in many crops due to the vegetative feeding parts of the plants (Hirsch, 2012).

In Turkey, *Otiorhynchus lubriculus* and *O. balcanicus* damage the strawberry (Altındışli *et al.*, 2004), and *Otiorhynchus scitus* Gyll., *O. peregrinus* Stierl., *O. sulcatus* F., *O. anatolicus* Boh., *O. ligustici* L., *O. turca* Boh., *O. aurifer* Boh., *O. carceli* Gyll. *O. rugosostriatus* Goeze from weevils, and *Megamecus shevketi* Marsh., *M. albomarginatus* Gyll. damage the vines (Anonymous, 2017).

This study was carried out in apricot cultivation of Isparta province in 2018-2019. In addition to the survey studies of *Oarius grisescens*; the emergence time of adults, the damage they caused and the data about the control of the pest were obtained.

MATERIALS AND METHODS

The primary material of the study was *Oarius grisescens* 1905 adults and apricot gardens, in which apricots were commercially grown in Aşağıkaşıkara and Aşağı Tırtar villages of Yalvaç district of Isparta province. In the gardens consisting of Roxana, Alyanak Aplikoz, Şekerpere and Iğdır apricot varieties, 50 to 260 trees are 15-20 years old. Information about the orchards is given in Table 1 and Figure 1. Other materials of the study were siliconized fibers, bell glass and various laboratory materials used to monitor and capture adults. Adult photos were taken using a Leica Z16 APO microscope.

Surveys were performed during 2018 and 2019 in two villages in the Yalvaç district of Isparta province where apricot cultivation was widespread (Table 1 and Figure 1). Judgement sampling was carried out in 6 different orchards of 2 different villages: at least 10% of trees were checked and trees, in which adult pests were detected, were considered infected (Anonymous, 2017). In addition, the root-collar and root parts of the trees were dug to detect *O. grisescens* eggs and larvae (Figure 2). Survey studies took place from May to December. The trunks of apricot trees were wrapped with siliconized fibers, 35-40 cm wide, approximately 35 cm to 40 cm above the ground (Figure 2). These fibers were initially checked twice a week, then at non-periodic intervals to determine the emergence time of *O. grisescens* adults. During the vegetation period, leaves, fresh shoots and buds were checked and the roots of apricot trees.

Table 1. Information about the apricot orchards where the surveys of *Oarius grisescens* Desbrochers des Loges, 1905 were carried out in Yalvaç district of Isparta province.

Coordinates	Plot No.	Area (da)	Apricot varieties	Village
38°17'27'027	1593	3037	25 Roxana	Aşağıkaşıkara
38°51'08'01			25 Alyanak	
38°16'41'07	830	9150	60 Alyanak	Aşağıkaşıkara

30°50'32'08			50 Roxana	
38°17'24'062	901	7000	10 Aplikoz	Aşağıkaşıkara
30°50'56'034			85 Aplikoz	
38°17'11'061	2054	21210	80 Roxana	Aşağıkaşıkara
30°50'38'016			100 Alyanak	
			120 Roxana	
			100 Şekerpere	
38°16'49'045	850	17100	120 Roxana	Aşağıkaşıkara
30°50'41'045			55 Alyanak	
			20 Şekerpere	
			20 Iğdır	
38°14'58'048	413	1020	40 Aplikoz	Aşağı Tırtar
30°45'19'023			110 Iğdır	
			110 Alyanak	

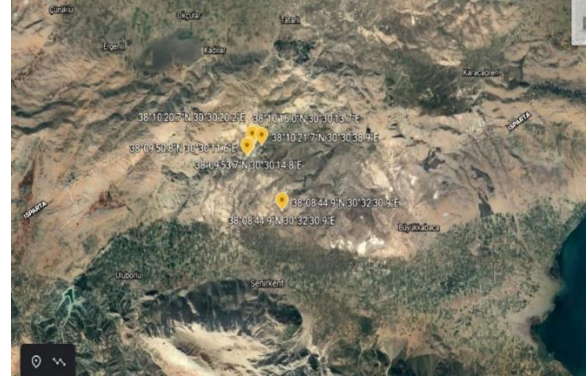


Figure 1. The coordinates of the survey area in the Yalvaç district of Isparta province



Figure 2. Siliconized fibers wrapped around the trunks of apricot trees to monitor *Oarius grisescens* adults

RESULTS AND DISCUSSION

In Aşağıkaşıkara and Aşağı Tırtar villages of Yalvaç district of Isparta province, where the surveys were carried out, leaves, shoots and roots of apricot trees were checked at non-periodic intervals starting from May, but no biological period of *O. grisescens* was observed in both years. (Figure 3). Considering that adults could move from the soil surface to the tree trunk, as in *Otiorhynchus* spp., apricot trees were

wrapped with siliconized fibers in early August and early September (Figure 3) in order to detect the adult pests. The adults were caught in both years as of September 15. *O. griseus* were caught extensively in siliconized fibers, and all the apricot trees were found to be contaminated with the pest (Figure 4 and 5). Adult emergence of black vine weevil, *Otiorhynchus sulcatus* (F.), from strawberries in Canterbury likewise occurred predominantly within 15 days and most adults emerged between October 23 and November 7. No adults were observed to overwinter (Penman and Scott, 1976).



Figure 3. Studies for determination of egg, larval and adult stages of *Oarius griseus* in root collar and root parts of apricot trees



Figure 4. *Oarius griseus* adults caught with siliconized fibers



Figure 5. *Oarius griseus* adult: *O. griseus* adults emerge starting from September 15 when the average temperature is 19.87°C (Max. 27.450°C, Min. 14.72°C), relative average humidity is 35.51% and the average soil temperature is 22.8°C (Max. 23.5°C, Min. 22.2°C). *O. griseus* is considered to have spent the winter in the adult stage. Indeed, *Otiorhynchus* spp. and *Megamecus* spp. spend the winter as adults on the ground, under leaves and in the soil. They hide in the soil and crevices at the bottom of the vines during the day. As the buds begin to sprout in spring, they gnaw swelling buds (Anonymous, 2017). As a result of the survey studies, *O. griseus* adults were found in the root area of apricot trees during the day and moved towards the trunk of trees in the evening. In a faunistic study on strawberry fields in İcel province, Bakircioğlu-Erkılıç (1996) reported that *Strophomorpha hebraeus* Str., a Curculionid species, was found in Anamur district, that only adults did the damage, that no larvae and damage were found in plant roots and that this species was a new record for the fauna of Turkey. *O. griseus* adults appeared from the second week of September, that they were active during September-November, and that they were found to be active in tree trunks until the first week of December, if the temperature was suitable. Thus, the adults were found in nature for approximately 6-7 weeks and fed on fruit and shoot buds during this period.

Although siliconized traps substantially reduced *O. griseus* density in apricot orchards, traps alone were not sufficient since the pest density was very high. Therefore *O. griseus* should be taken under control with an appropriate insecticide. Antonelli and Campbell (1981) have reported that, in addition to the chemical control of *Otiorhynchus sulcatus*, sticky bands on tree trunks supply an effective barrier by restricting the movement of adult individuals. The best time for the chemical application of *O. griseus* is the second week of September, after harvest when the adults start to emerge. Another research concluded that the most appropriate spraying time for *Otiorhynchus* spp. in strawberries in İzmir province is October-November, when

the larvae start to cause damage and actively feed around the fibrous roots (Altındışli *et al.*, 2004). In this study, the larval period of *O. griseus* could not be found, but it was observed that the adults caused economic damage, especially in shoot buds. The first emergence point of *O. griseus* was identified in Taşevi district as areas bordering the forest, where there are either scrub or shrub and herbaceous plants. Indeed, *Otiorhynchus* spp. was polyphagous and associated with many host plants belonging to Apiaceae, Asteraceae, Rosaceae, Caprifoliaceae, Liliaceae, Poaceae, Fabaceae, Scrophulariaceae and Saxifragaceae (Majka and MacIvor, 2009; Staverlokk, 2010). Hence, it is considered that *O. griseus* are most likely transmitted to apricot orchards from maquis shrubland. *O. griseus* cause severe damage by opening fruit holes and shooting buds in all trees (Figure 6). In apricot orchards where siliconized fiber traps were not used, the yield loss rate almost reached 100%. Although traps alone were not sufficient, the mass trapping method should be applied when the number of adults is low.



Figure 6. *Oarius griseus* Desbrochers des Loges, 1905 damages the shoot buds of apricot trees.

Conclusion: In conclusion, *O. griseus* should be monitored with siliconized fiber traps in apricot orchards starting from September. Considering that apricot is a substantial export product for Turkey and that the pest will lead to direct crop loss, it would be appropriate to control *O. griseus* adults after harvest within IPM (integrated pest management) approach using a suitable insecticide with mass trapping to reduce the population.

Authors Contribution Statement: Inal B: Conceived the idea, designed the study, and wrote the article; Ozdem A: Assisted in writing the article.

Funding: None

Acknowledgements: We would like to express our deep gratitude to Alim ŞAHİN and the staff of Isparta Directorate of Provincial Agriculture and Forestry (Republic of Turkey Ministry of Agriculture and Forestry). We would also like to

extend our thanks to Roman BOROVEC (Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Department of Forest Protection and Entomology) for identifying insect samples. **Conflicts of Interest:** The authors declare no conflict of interest.

REFERENCES

- Anonymous. 2017. Kayısı Entegre Mücadele Teknik Talimatı. Available online at <https://www.tarimorman.gov.tr/TAGEM/Belgeler/Entegre/kay%C4%B1s%C4%B1%20entegre.pdf>
- Anonymous. 2019. Bitkisel üretim istatistikleri, Taş çekirdekli meyveler. Available online at http://www.tuik.gov.tr/PreTablo.do?alt_id=1001
- Anonymous. 2020. Türkiye Geneli Kuru Kayısı İhracatı. Available online at <http://www.malatyatb.org.tr/home/fileView/36b5829c-32bc-4503-a0bf-b6affdac2921/7>
- Altındışli, Ö. F., R. Altınçağ and A. A. Dündar. 2004. Investigations on *Otiorhynchus* spp. (Coleoptera: Curculionidae) which damage strawberry plantations in Izmir province. Plant Protection Bulletin. 44:15-36.
- Antonelli, A. L. and R. L. Campbell. 1981. Root weevil control on rhododendrons. Washington State University Cooperative Extension Bulletin 0970.
- Bailey, L. H. and L. F. Hough. 1975. Apricots. In: Janick, J., Moore, J. N. Advances in fruit breeding. Purdue University Press, West Lafayette, Indiana. 367-383.
- Bakırcıoğlu-Erkılıç, L. 1996. A new pest of strawberry (*Fragaria ananasa* Duch.) in Turkey: *Stromorphus hebraeus* Str. (Coleoptera: Curculionidae). Turk. J. Ent. 20:93-96.
- Hill, D. S. 1987. Agricultural Insect Pests of Temperate Regions and their Control. Cambridge, UK: Cambridge University Press
- Hirsch, J. 2012. *Otiorhynchus* spp. (Coleoptera: Curculionidae) as pests in horticulture: genetics and management options with entomopathogenic fungi. Fakultät Naturwissenschaften. Institut für Zoologie, Doctoral thesis.
- Majka, C. G. and J. S. MacIvor. 2009. *Otiorhynchus porcatus* (Coleoptera: Curculionidae): a European root weevil newly discovered in the Canadian Maritime Provinces. J. Acadian Entomol. Soc. 5:27-31.
- Penman, D. R. and R. R. Scott. 1976. Adult emergence and egg production of the black vine weevil in Canterbury. NEW ZEAL J. EXP AGR. 4:385-389.
- Staverlokk, A. 2010. *Otiorhynchus armadillo* (Rossi, 1792) (Coleoptera, Curculionidae), a weevil new to Norway. Nor. J. Entomol. 57: 9-11.
- Sykes, J. T. 1972. A description of some quince cultivars from western Turkey. Econ. Botany 26: 21-31.